



The DØ Upgrade Project

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Contents:

- Last year: an overview
- Status & Projection
- Summary



Last year in review: project

Fermilab, PAC April 2000

Strong management team, good mix of dedicated
users & *FNAL staff*

Upgrade management: *M.Tuts* & *H.Weerts*
H.Montgomery & *J.Kotcher*

Summer/Fall 1999: DØ develops new schedule
with guideline: **realistic**

Complete Oct' 99

Completion date: July 2000 → Feb. 7, 2001
Reportable set of milestones, PMG every two
weeks, monitor & update schedule bi weekly,
excellent cooperation FNAL ↔ DØ

Director's review of Installation & Commissioning
 **(early Dec 1999)**

Focus on installation: sequence & schedule
Much better understood by DØ
Evolve from rigid sequence to one with flexibility

Bottom line in January:

- Split silicon in a two independent halves
- 2-3 months of contingency/slack in silicon delivery
- Maintain readiness for beam in Feb. 2001



Increased confidence to be ready on March 1, 2001



Last year \$\$\$\$

Fermilab, PAC April 2000

Financial status of Run II detector project:

At November 1999 DOE-Lehman review indicated that contingency was "uncomfortably low".

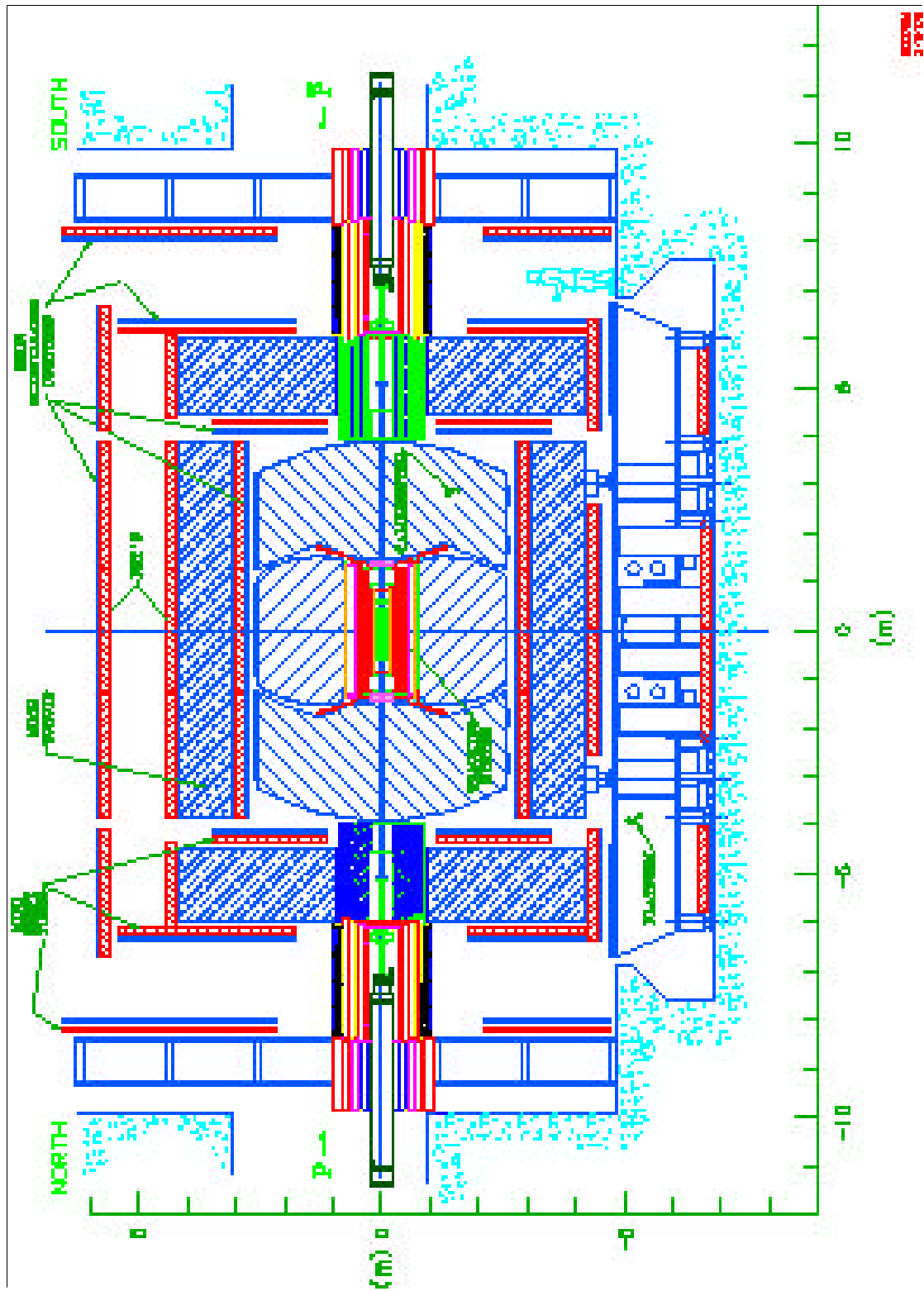
- Identified a projected shortfall in February
- Presented to Fermilab
- Intensive cost review (20 reviewers) in March
- Review agreed with our assessment, increase contingency
- Fermilab agrees with DOE
- Change request has been sent to DoE

				K dollars
Total cost estimate		Equipment only		\$41,522
Estimate to complete		no contingency	Jan-00	\$ 3,771
Increase in cost				\$ 1,295
Contingency total				\$ 1,643
Total overrun				\$2,938

- Forward funding capability for > \$1.8M



Overview of D0 detector for Run II





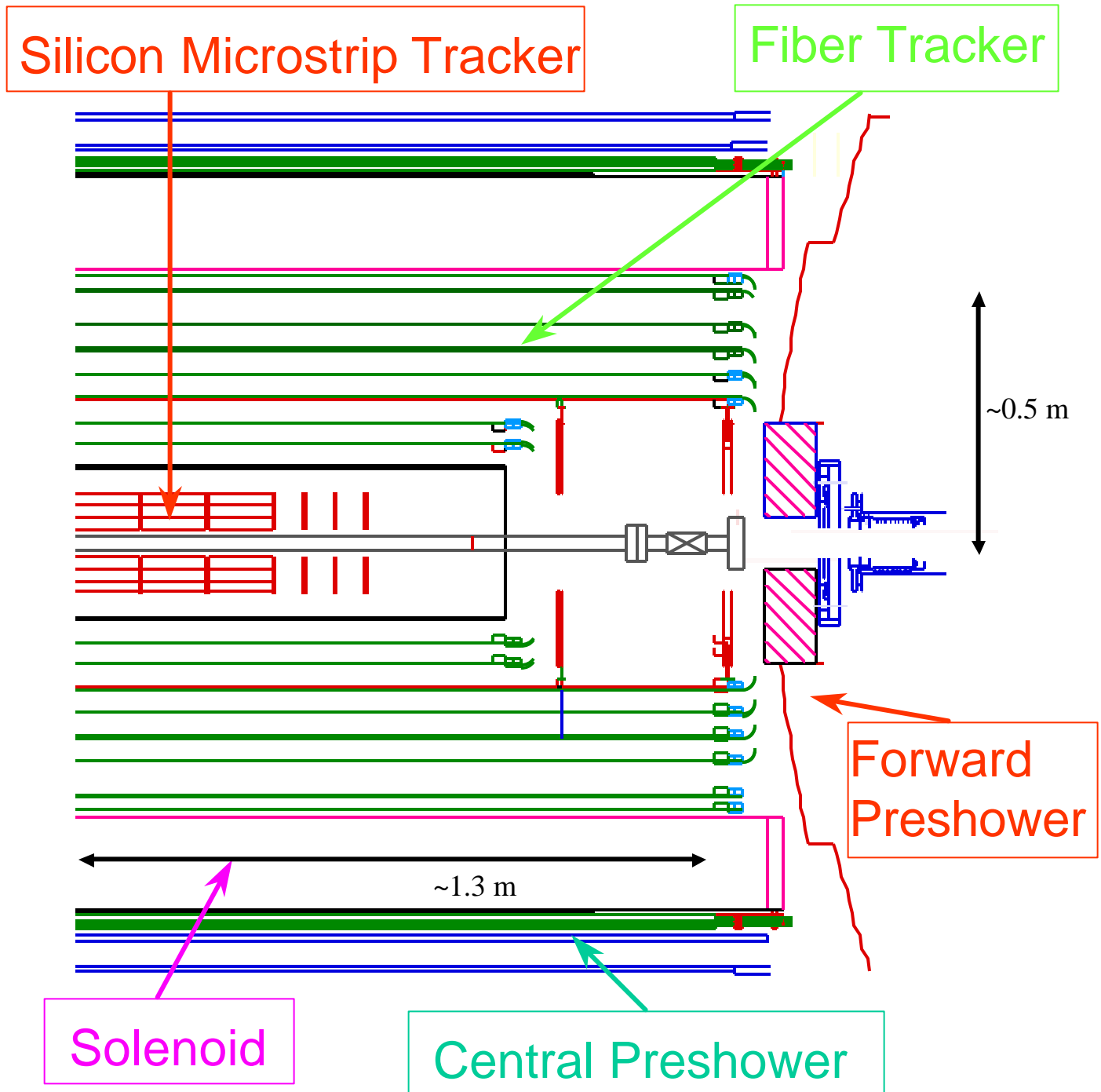
Status

Overview of detector

Detail	Subsystem	Status
yes	Silicon	production
yes	Fiber tracker	production
	Solenoid	working
	Central Preshower	installed
	Forward Preshower	complete
	Intercryostat detector	90% complete
	Luminosity monitor	production
	Calorimeter electronics	production
	Muon Central	commissioning
yes	Muon Forward	production
yes	Trigger & DAQ	production & use
yes	Online	in use
yes	Installation	in progress
yes	Commissioning	in progress
	Computing	commissioning



Tracking System Overview



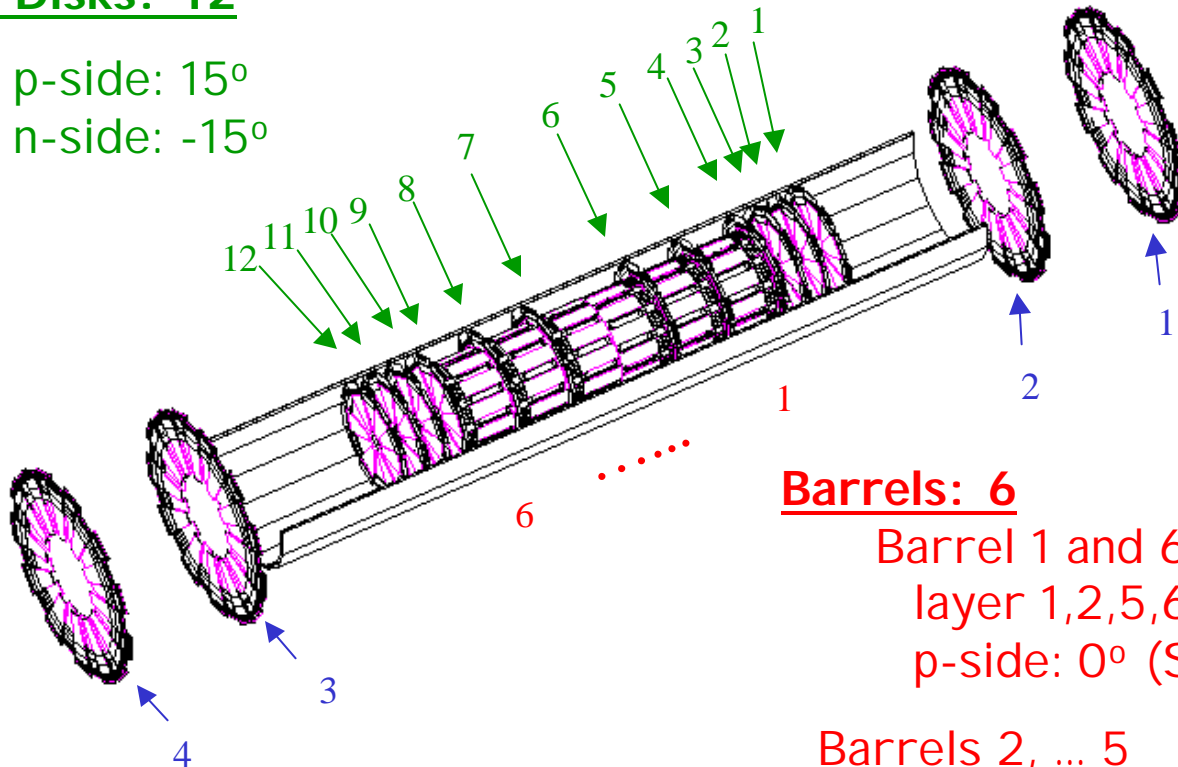
*All detectors here use **SVX2e** chip readout*



DØ Silicon Microstrip Tracker (SMT)

F Disks: 12

p-side: 15°
n-side: -15°



H Disks: 4

p-side: $\pm 7.5^\circ$ (SS)

Barrels: 6

Barrel 1 and 6:
layer 1,2,5,6:
p-side: 0° (SS)

Barrels 2, ... 5
layer 1,2,5,6:
p-side: 0°
n-side: 90°
layer 3,4,7,8
p-side: 0°
n-side: 2°

	Barrels	F-Disks	H-Disks
Channels	387072	258048	147456
Modules	432	144	96
Inner R	2.7 cm	2.6 cm	9.5 cm
Outer R	9.4 cm	10.5 cm	26 cm



Silicon status

Difficult system to go into production:

Micron sensor delivery, HDI 's, stuffing HDI 's,
starting assembly, bonding, low yields initially

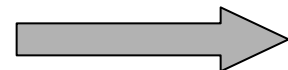
Now have everything in place: ordered additional
components, SiDet in production, manpower in place

Current status

Spares not
included

		needed	sensors have / to go	hdi's stuffed have / to go	detectors (ladders)	ladders tested
3-chip	0° single sided	72	72 / 0	72 / 0	66	40
6-chip	DSDM, 90°	144	60 / 84	144 / 0	58	25
9-chip	0°, 2° DS	216	166 / 50	156 / 60	120	62
F- wedge		144	100 / 44	94 / 50	50	9
H- wedge		192	170 / 22	192 / 0	162	150

Production projections....

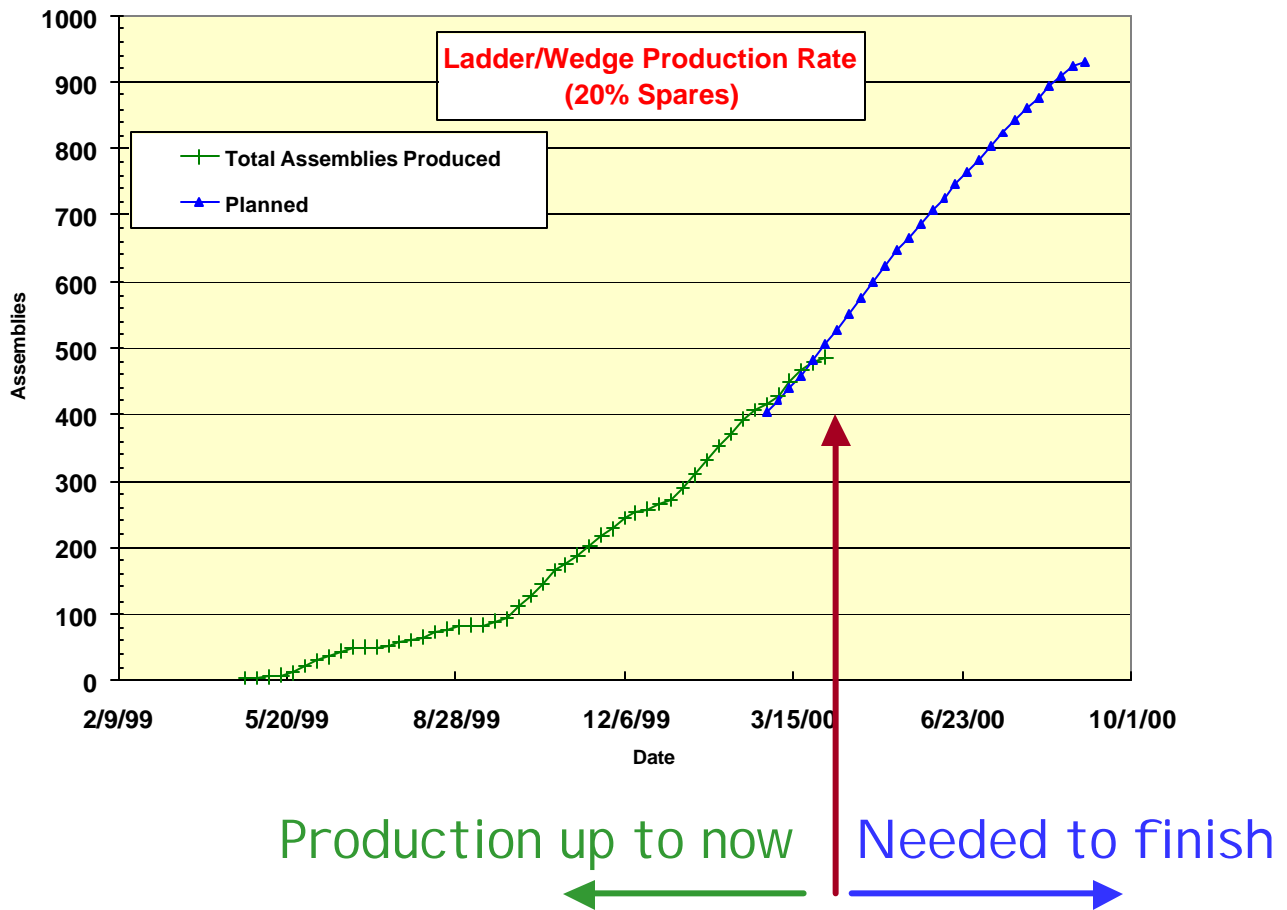




DO SMT Ladder/Wedge production

Fermilab, PAC April 2000

Production projections....



Required production in future, assumes:

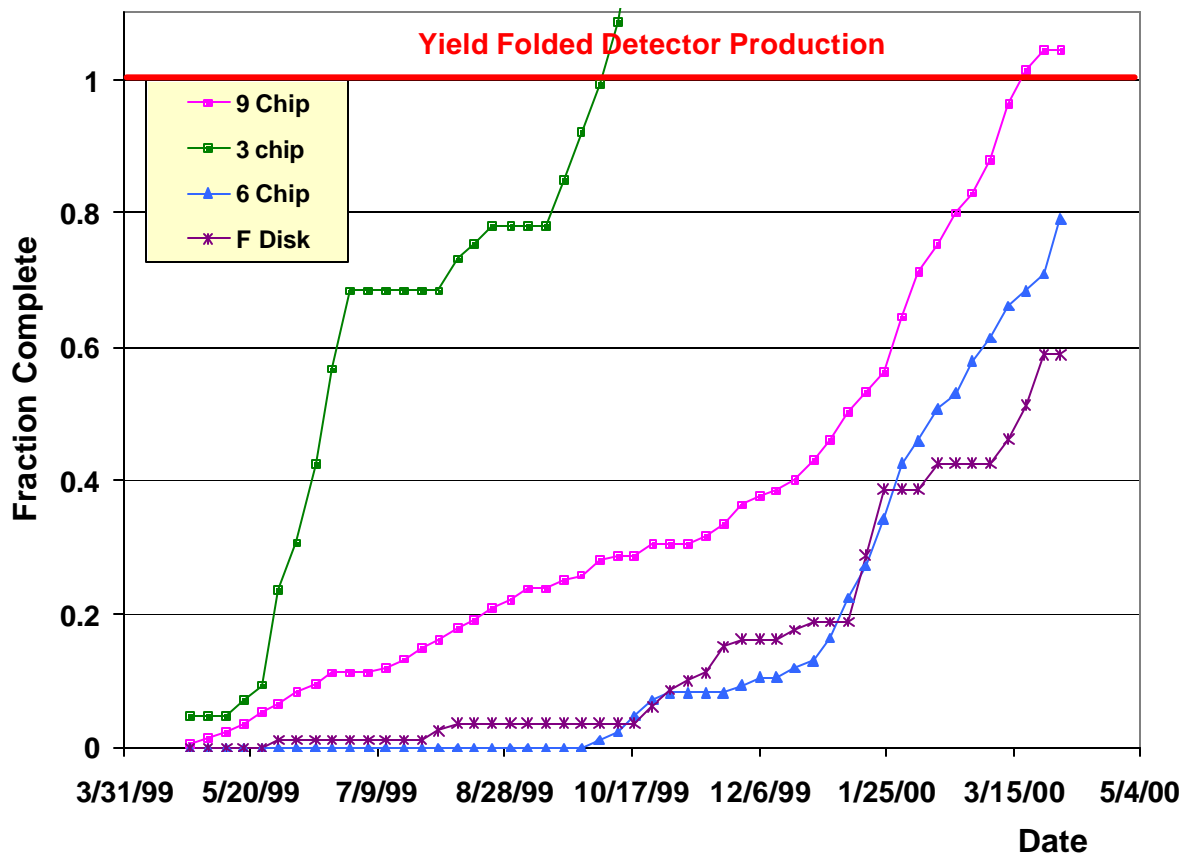
- First half cylinder @ D0 on August 1, 2000
- Second half cylinder @ D0 on November 1, 2000



Production Status for first half cylinder

Fermilab, PAC April 2000

- New Schedule based on split support cylinder:
 - First half cylinder by August 1
 - Second half cylinder by November 1
- Last dates for detector production:
 - F Wedges: June 26, 2000
 - 6-chip ladders: June 12, 2000

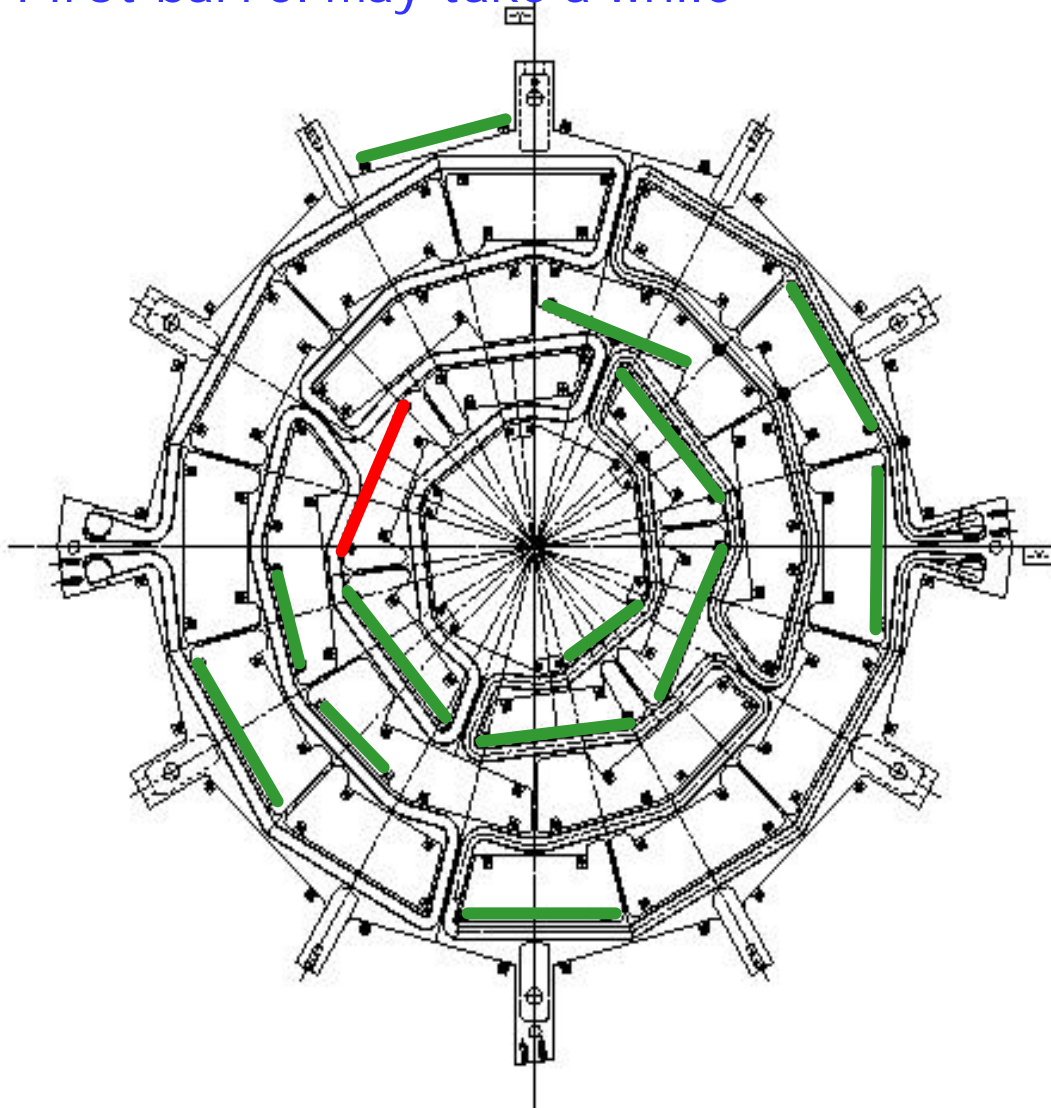




First Barrel Assembly

Fermilab, PAC April 2000

- Currently 20 ladders installed in first barrel
 - Bugs being worked out
- Start with outer ladders, every 60°, work radially inward
- First barrel may take a while



Grade B (electrical)

Grade C (electrical)

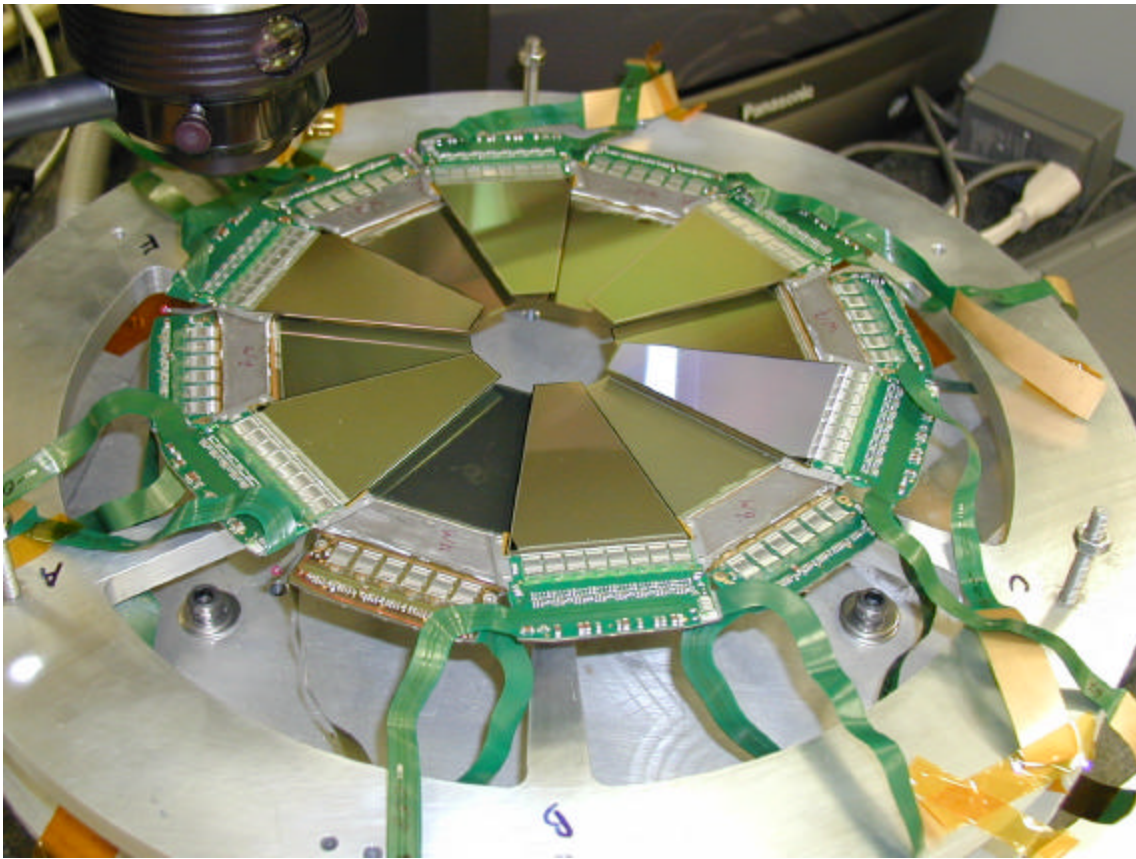
Early decisions are being made.



Completed Subassemblies

□ 14th F-disk complete !

- Mainly mechanical grade ladders (1 detector grade)
- Used to establish procedures and alignment



□ 1st F-disk schedule:

- Waiting for pORC



Fiber Tracker Overview

● Scint Fibers

830 μ m \varnothing , multiclاد

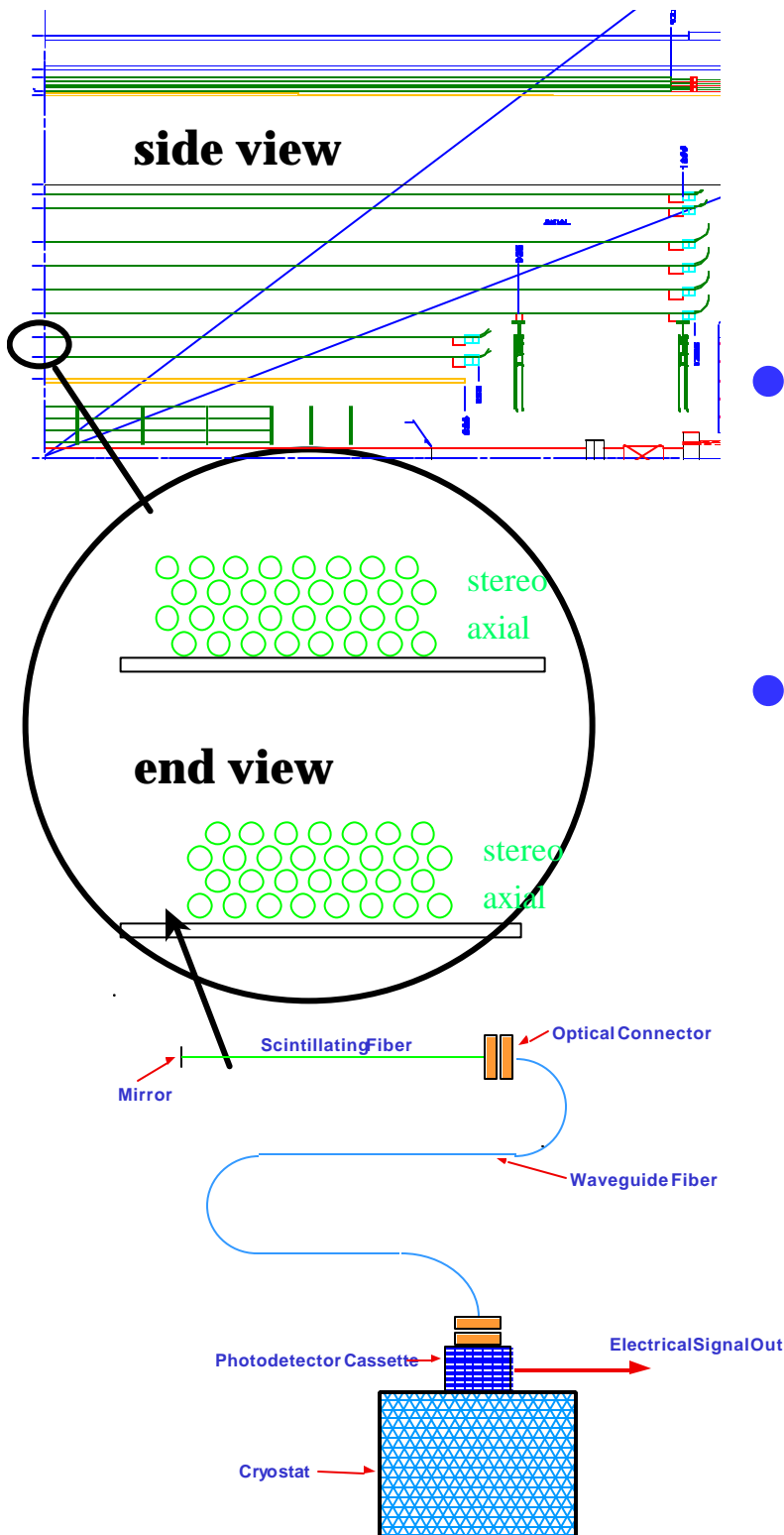
- 1.6-2.5m active length
- 10m clear waveguide to photodetector
- rad hard (100 krad)
(10yr @ 20cm @10³²)

● Fiber Ribbons

- 8 cylinders →
- 8 axial doublets
- 8 stereo doublets
(3° pitch)

● Readout

- 77,000 channels
- VLPC readout
- run at low temp (9 °K)
- fast pickoff for trigger
- SVXII readout



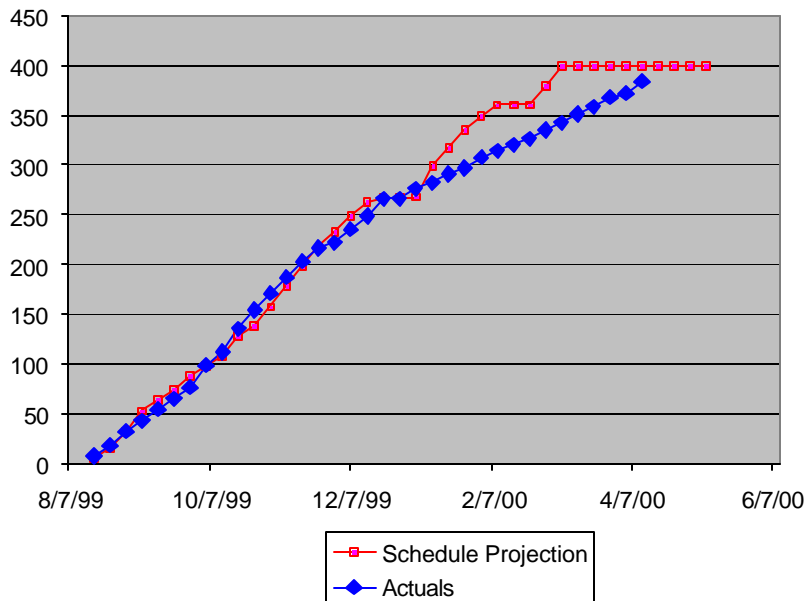


Fiber Tracker status

Mechanical assembly:

All cylinders made

Ribbon Production

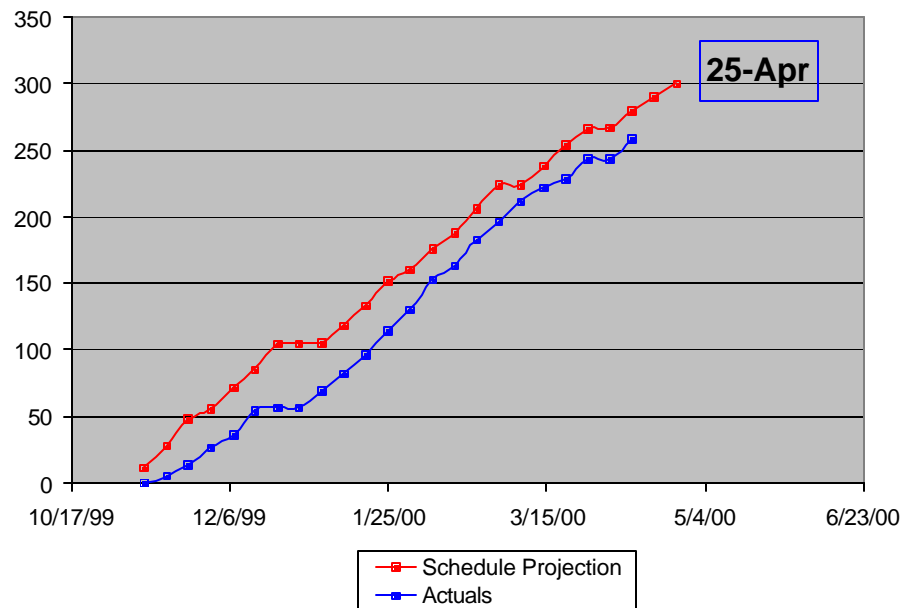


Making ribbons
&
connectorization
production

Done next week.....

Ribbon mounting:
Cylinders 8, 7, 6,
5, 4,3 done.
(2& 1 to go)

Ribbon Mounting



Clearly see end of this, but remains R&D and QC crucial

ALL THE WAY



Fiber tracker status cont'd

Assembly of cylinders = nesting

Cylinder 8,7,6,5 & 4 installed and glued.
In production

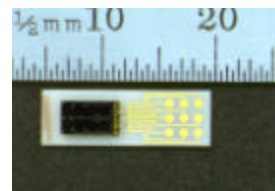
Waveguide production

300 bundles with 256
fibers each

Preproduction (bundles and sheathing) well
along (60% complete); last connectorization
problems solved;

produced the waveguides for
central preshower

VLPC cassette production



8 channel
VLPC chip

VLPC at cryogenic temp.

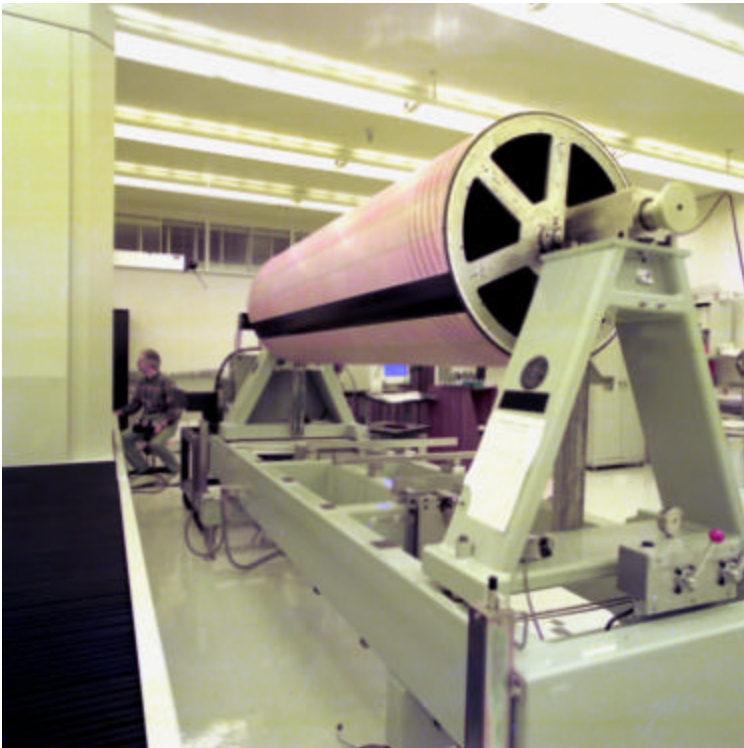
Flex circuit from cold → warm, difficult

Now have 350 good flex circuits (total 2000)

First 4 production(out of 100) VLPC cassettes built

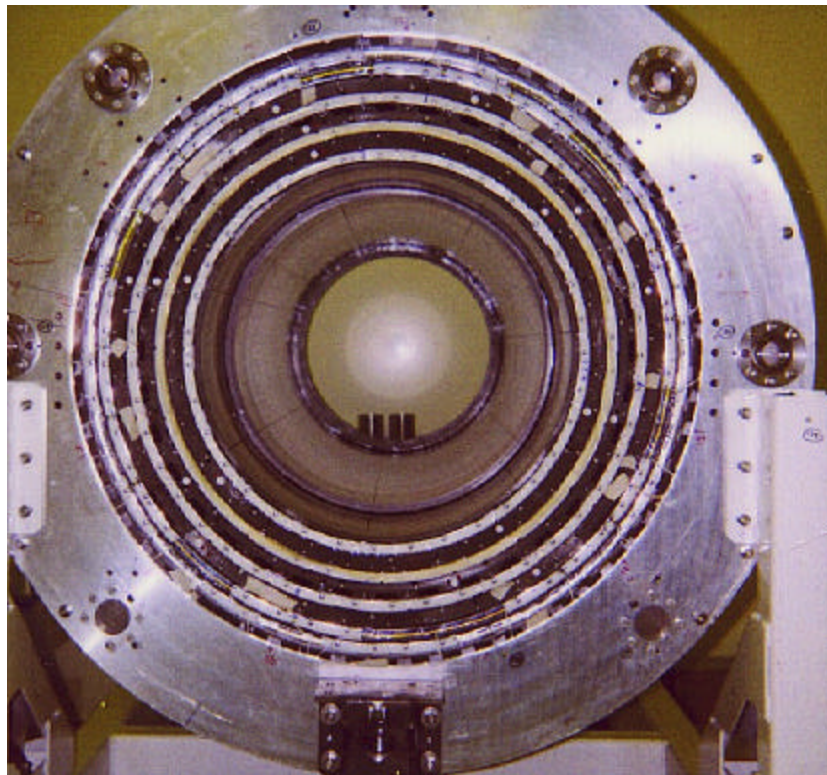


Pictures from Lab 3



Cylinder 5, last
axial ribbon
missing

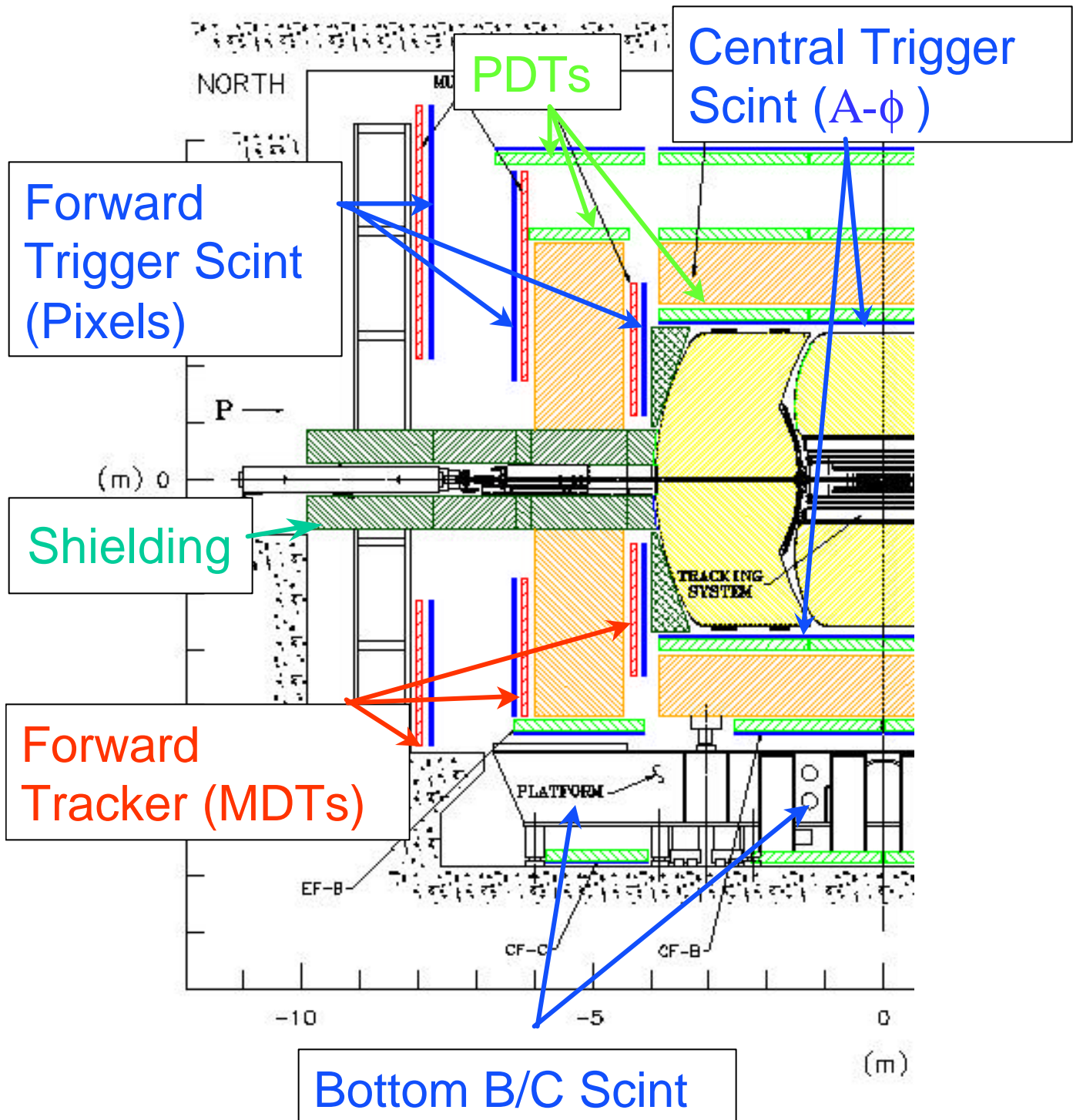
Nesting
cylinder
8



**Cylinders 8,7,6,5,& 4 nested
CFT Completion - 5/19/00
Delivered to DAB by 6/9/00**



Muon Detector Upgrade



MDT = Mini Drift Tube



Muon forward system status

Detectors (pixels, MDTs & central A- Φ)
constructed by Russian collaborators

Assembly into large detector planes at FNAL Lab F

Trigger pixels	A layer	B layer	C layer
#counters	1600	1600	1600
octant assembly	16 done	16 done	16 done
tested	16	16	16
installed	none	none	none

Scintillators
built @
IHEP/Protvino;
all delivered;
assembly into
octants done

MDTs built @
JINR, Dubna;
A, C @FNAL
Assembly
started

MDTs	A layer	B layer	C layer
# counters	2319	2207	2507
octant assembly	16 done	none	none
tested	6/16		
installed	none		

Installation is highest priority; sequence is A,C, B
determined by priorities and fallback options



Trigger, DAQ & Online

Commissioning Goals for March 15

Use m System for m, L1, L2, L3, Online
Continued running of L1, L2, L3, Online

1. Three cosmic triggers:
 - a. Cosmic Cap (Top)* Af Counters → For Maximal area coverage
 - b. Cosmic Cap (Top)* Beam Scintillator → For beam constraint
 - c. L1 m-trig → exercise actual trigger
2. Run control governed by the COOR
3. Synchronized Single Detector (Muon) Multi-crate readout packed in L3 system
4. Reconstruct random tracks from 1.a
5. Online monitoring & Event display
6. Data shipping via RIP to FCC
7. Offline Reconstruction at FCC
8. Exercise L3 m filtering
9. Make DAQ/Online System continuously available & Control Room Operational

DONE



Installation

Installation sequence for many years driven by Run I experience: move large pieces in very **tight** space.

Step I in summer of 1999: decouple the fiber tracker & silicon → flexibility

Since Dec '99 review & for fallback options:
effort on developing contingency/slack

Result:

1. Change installation sequence → **two months** of contingency for SMT delivery (but squeeze ECS)
2. SMT deliver as north & south half, **add one more** month of contingency (no squeeze on ECS)

Installation is driving upgrade efforts. A lot of effort in hall; parts/detectors arriving; commissioning effort.



Installation milestones/critical dates

Installation

June 1, 2000	Decision on whether to install south muon truss in collision hall during August.
June 15	Latest date for CFT to DØ (consistent with August truss installation)
July 1	Muon detector planes and shielding must be installed on south truss (for August installation).
August 1	Baseline date for north half silicon detector (SMT-N) to DØ ; start south muon truss installation in collision hall.
August 21	South truss installation in collision hall completed.
September 1	Fallback date for delivery of SMT-N to DØ.
November 1	Baseline date for south half silicon detector (SMT-S) to DØ. Latest possible date for SMT-N at DØ. Install north truss in collision hall.
December 1	Decide whether to move into collision hall by December 15 or remain with default schedule.
December 15	Latest date for SMT-S to DØ (consistent with installation before roll-in).
January 15, 2001	Latest date for detector to roll into collision hall.
March 1, 2001	Run II begins.



Summary

Progress in D0 Upgrade over last year very good, we are converging

Detector “production lines” are working everywhere (but it is really R&D all the way)

Monitoring schedule since September '99: alleviate bottlenecks as they occur.

Fallback/Schedule Contingency exercise was very useful

We are on schedule and have created 2-3 months of contingency/slack in last two months.

Definitely have moved into installation phase.

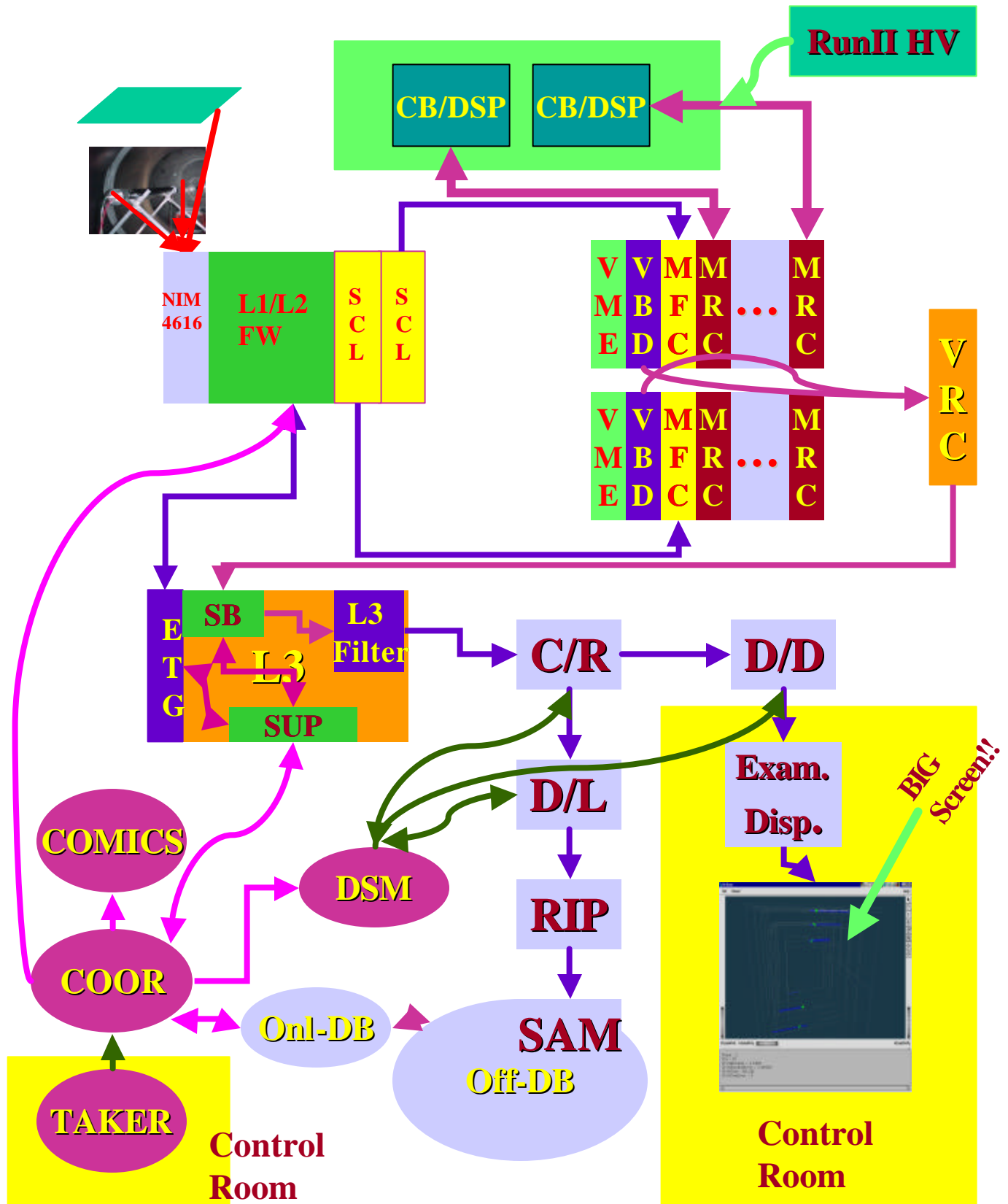
Projection:



D0 will be ready in mid February 2001 for the start of Run II.

Commissioning Goals for March 15th

DONE





"Beyond the baseline"

Silicon Track Trigger

- Funded through MRI , DoE and Matching
- Design in progress
- Review in February
- Completion date Feb 2002

Forward Proton Detector

- All Roman pots/castles (6) built at LNLS, Brazil
- Now installed in Tevatron (as we speak)
- Will take part in Engineer/Commiss. Run
- Partially instrumented
- Remaining funding for detectors requested from NSF,MRI